FY15 RSM-EWN IPR

Seattle District, Ediz Hook Post-dam removal shoreline change analysis

David R. Michalsen, P.E.

BLUF: Two dams on the Elwha River were removed in late 2011, sending a large pulse of sediment into the Elwha River Littoral Cell (ERLC). Ediz Hook located at the downdrift end of the ERLC began a beach nourishment program in 1978 to mitigate for loss of sediment supply from the delta and shoreline armoring. Now that sediment from the ER delta has been restored, we are investigating how this large sediment pulse will affect O&M of Ediz Hook over the next 50-year life cycle

Problem Statement/Issue

- Ediz Hook protects the only deep-draft NAV channel on the Strait of Juan de Fuca
- USCG has a strategic air station on Ediz Hook for S&R
- O&M program partners with City of Port Angeles to renourish Ediz Hook with cobble ~5-10 years. O&M funding and cost-share $$ are not routinely available (deferred maintenance)
- Loss of nearshore habitat due to beach coarsening

Approach to Address Problem

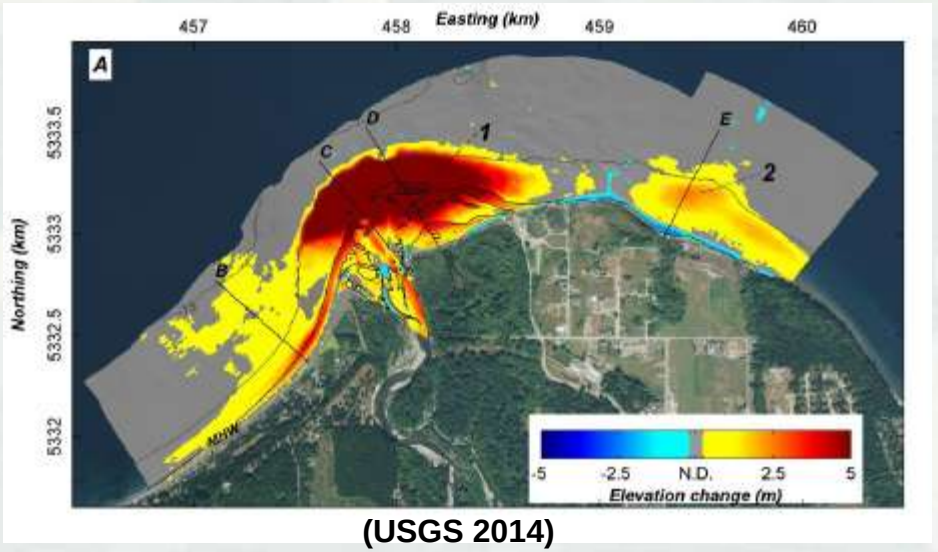
- Determine if O&M demands will decrease & if so when will this occur?
- Can sand/gravel vs. cobble be utilized in future nourishment(s) to increase habitat value?
  - Develop sediment budget over ERLC
  - Perform shoreline change modeling to help guide future management decisions

FY15 RSM-EWN IPR
Ediz Hook Post-dam removal shoreline change analysis

Approach to Address Problem
(Tools, Models, Technologies)

- Define Sediment Budget for ERLC
  - Quantify temporal and spatial scales of Elwha bluff erosion – seasonal high density surveying (USACE/WDoE)
  - Quantify temporal and spatial scales of riverine input from Elwha River into the nearshore delta – seasonal high density surveying (USGS/WDoE)

- Construct shoreline change model
  - Build GenCADE model
  - Utilize existing CMS-WAVE model for wave transformation
  - Calibrate/Validate GenCADE model to observed survey data
  - Perform long-term shoreline change scenarios and sensitivity tests to guide future O&M decisions



(USGS 2014)

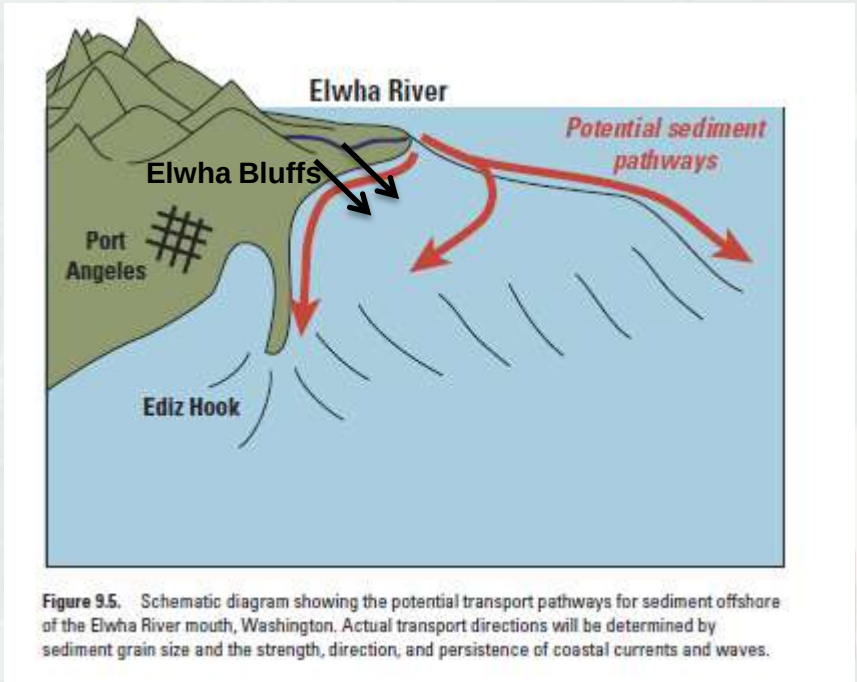
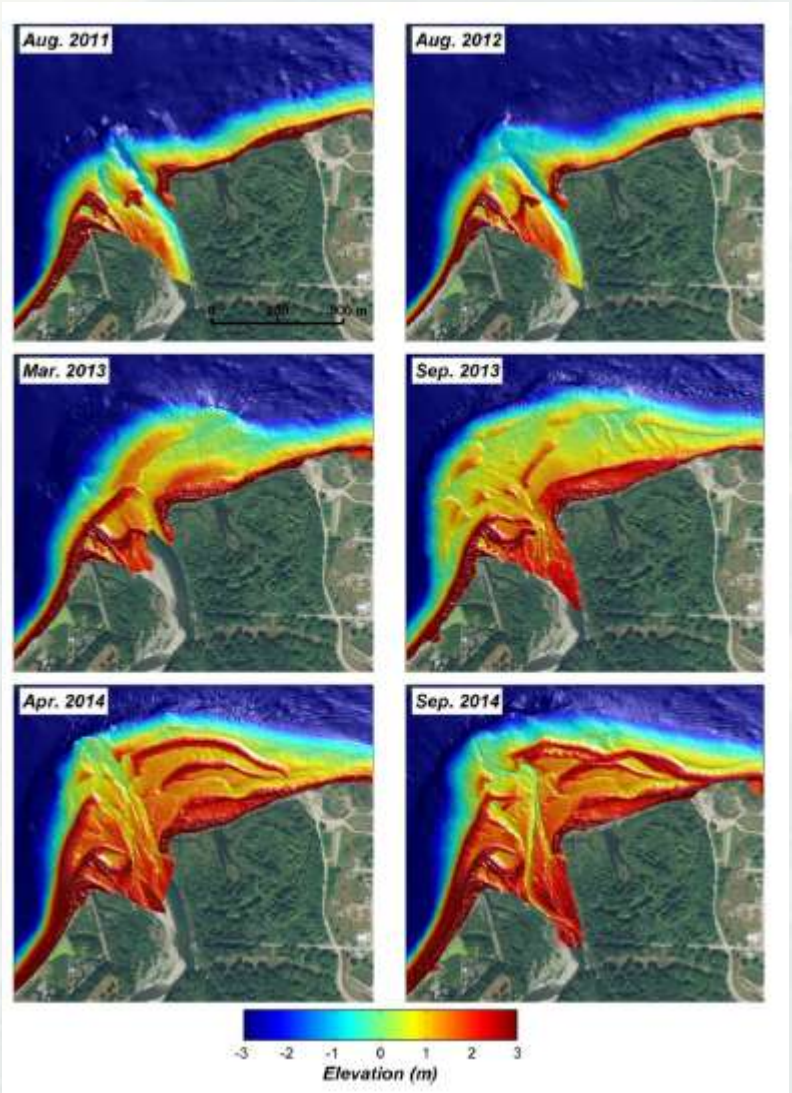


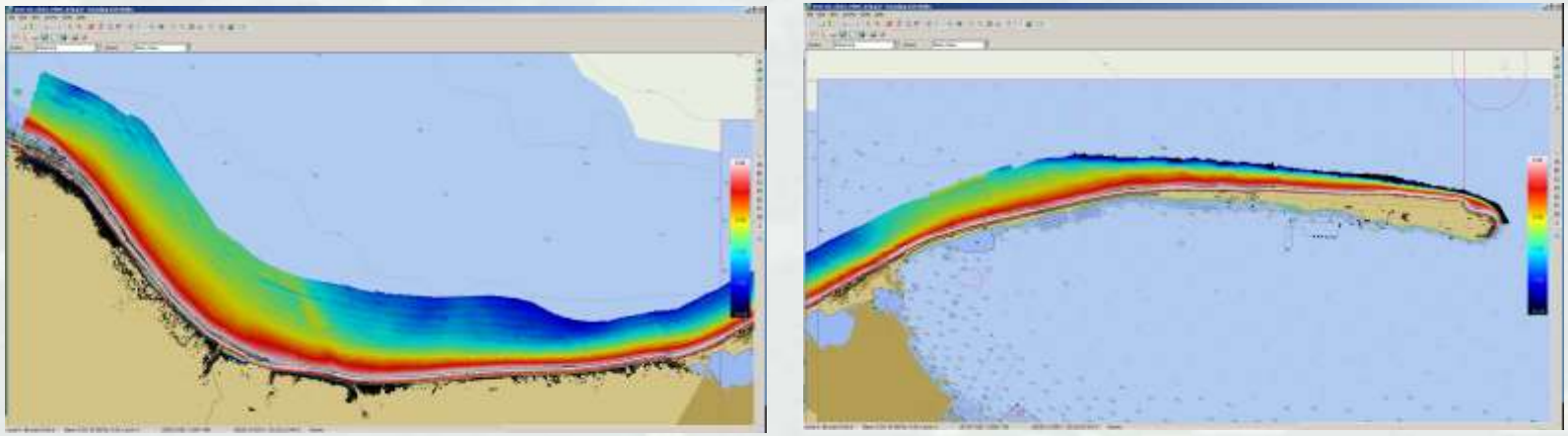
Figure 9.5. Schematic diagram showing the potential transport pathways for sediment offshore of the Elwha River mouth, Washington. Actual transport directions will be determined by sediment grain size and the strength, direction, and persistence of coastal currents and waves.



(Miller et al 2014)

FY15 RSM-EWN IPR
Ediz Hook Post-dam removal shoreline change analysis

Approach to Address Problem
(Tools, Models, Technologies)



Ediz Hook- Nearshore Multibeam Bathymetry & Lidar Topography

Raw, unprocessed preliminary data collected by Ecology CMAP, 14-18 June 2015

Next survey scheduled in October 2015

FY15 RSM-EWN IPR

Ediz Hook Post-dam removal shoreline change analysis

USACE RSM PDT

- David R. Michalsen, Coastal Engineer
- Scott H. Brown, Coastal Engineer
- Elizabeth A. Chien, NAV Coastal Program Manager

Stakeholders/Partners

- Washington Department of Ecology (WDoE)
- U.S. Geological Survey
- City of Port Angeles
- Coastal Watershed Institute - NGO

What key leveraging opportunity(s) did stakeholders/partners provide?

- Boat based lidar, multibeam hydrosurvey, GPS backpack surveying equipment
- Surveying field crew
- Grain Size data
- Nearshore wave data
- Aerial photos

GenCade modeling

- Coupled with existing CMS-WAVE spectral wave model developed for the Strait of Juan de Fuca
- Recent delta and bluff surveys will be used to specify sink/source boundary conditions
- Empirical longshore transport coefficients (K1 and K2) coefficients are calibrated/validated using survey data / aerial photos

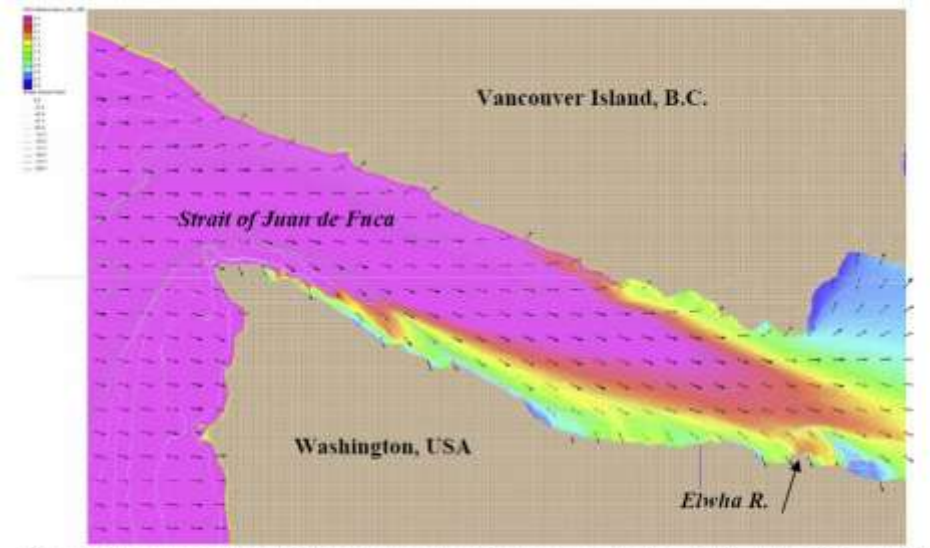


Figure 2. Computed wave height and wave direction (vectors) for Case 4: R = 50 yr, Dir = 280°)

FY15 RSM-EWN IPR

Ediz Hook Post-dam removal shoreline change analysis

UPs – 3 Positives from effort

- Successful collaboration between federal, state, city, and NGO
- Opportunity to explore ecosystem enhancement at an existing NAV project
  - May also help jump start an ecosystem restoration CAP (Section 206) project
- Case study for GENCADE on the West Coast.

FY15 RSM-EWN IPR

Ediz Hook Post-dam removal shoreline change analysis

DOWNs – 3 Negatives from effort

- Difficult to fit a study of this scale into the fiscal year funding cycle – it would benefit from additional data collection.

- Difficult to implement study findings immediately into the O&M program.

FY15 RSM-EWN IPR

Ediz Hook Post-dam removal shoreline change analysis

Value to the Nation

- Cost savings to O&M program
    - Decrease frequency and magnitude of nourishment
    - Feasibility of native sediments for achieving NAV objectives. Native materials have lower unit cost vs. commercial quarry
- Environmental benefits
    - Providing baseline information to guide Section 206 CAP study with City of Port Angeles – NGO very interested in using results to site potential projects
- Improved partnerships
    - Quantification of bluff erosion rates through our surveying/mapping efforts will help the City/County/State with their Shoreline Master Program which makes decisions regarding development in high risk areas